cheeses, and is the active principal of ergot. From leucine in a similar manner may be formed isoamylamine, while from tryptophane is produced indole ethylamine. Histamine, a very powerful toxin, is formed (by the action of putrefactive bacteria) from histidine. Its action on the nervous system produces symptoms identical with those of anaphylaxis. In like manner the diamines, cadaverine, putrescine, and tetramethyldiamine are formed respectively from lysine, arginine, and ornithine.

It becomes evident, therefore, that in a study of hypertension, we must reckon with not only the amino acids, but with the bacteria concerned in intestinal putrefaction. During the past three years in making observations on the flora in intestinal putrefaction we found that we could change the flora at will by changing the diet, and that coincidently with a continuous carbohydrate diet there was a disappearance from the urine of the absorption products of putrefaction. More recently, Kendall, of Northwestern University, has demonstrated that the intestinal flora are definitely related to the diet of the host, also that putrefaction may be retarded by a carbohydrate diet, and records some interesting facts as a result of his experiments. He reminds us that the bacillus bifidus which is obligately fermentative, requiring carbohydrates, is characteristic of the flora of nurslings, producing a constantly acid reaction. As the child becomes older and the diet includes more protein, this type of bacteria decreases and there is a remarkable increase in the colon bacilli which are facultative and can grow equally well on either protein or carbohydrate pabulum. The entire life cycle of these bacteria is carried on within the intestinal tract of its host and the metabolism of both microbe and host are similar in many respects. The products of the metabolism of normal intestinal bacteria are harmless, but according to the diet of the host, even a colon bacillus, which is a lactic acid bacillus, may play a dual personality. If it becomes necessary for a colon or a proteus bacillus to utilize proteins for energy, an enzyme is formed, the function of which is to prepare the protein product for assimilation, and in accomplishing this, certain chemical changes take place, as various substances are split off in order to find the carbohydrate residue necessary for the energy of the bacteria. If, however, utilizable carbohydrate is available for their energy, these enzymes are not formed. The chemical products of many of the pathogenic bacteria, in the presence of utilizable carbohydrates, are identical with those of the lactic acid bacilli, while these same organisms, if grown in carbohydrate-free media, form their specific highly toxic products. The protein sparing effect of carbohydrates, so well known in the metabolism of the human body, is here demonstrated in the metabolism of bacteria, and this fact is well worth our consideration, since we may thus shift the metabolism of intestinal bacteria by supplying available carbohydrates for their energy with a resulting formation of benign products.

During the past eighteen months we have made observations on a number of patients with varying degrees of hypertension. These observations, which have extended over periods of weeks or months, consisted of daily examination of feces, daily study of body metabolism, together with functional tests of liver and kidney. Some of these patients had lowered kidney function, others had lowered liver function, some had both, while still others had neither, but all responded promptly to a carbohydrate diet by a lowering of the blood pressure and a lessening of the products of putrefaction. Proteids were gradually and carefully added, but only up to the actual body requirements, always watching the effect upon the intestinal flora, providing for normal intstinal motility and keeping the carbohydrates so much in excess that they could not all be absorbed from the upper intestinal tract, thus insuring plenty of available suitable pabulum for the necessary energy of the intestinal bacteria.

At the present time lowered kidney and liver function, lowered pancreatic function, anemias and a number of other diseases are being cured by a proper adjustment of diet, and now hypertension may be alleviated or cured in like manner, simply by preventing the amino acids which have safely passed through the fires of protein metabolism, from being torn to pieces by the intestinal bacteria to furnish their necessary energy. Verily we live around the digestive tract.

A STUDY OF ONE HUNDRED AND FIFTY CASES OF HYPERTENSION.

By ROLAND CUMMINGS, M. D., Los Angeles.

The subject is so extensive that we have limited our studies to the etiology and the treatment as carried out in the cases reported. It seems best here to define some of the terms or expressions which will be used throughout the paper.

Apical abscesses are spoken of only when the X-Rays have unquestionably demonstrated an abscess at the apex of the root of one or more teeth. The expression "bad teeth" refers to teeth that are crowned, or to a condition, which, from the appearance of both teeth and gums, is suggestive of root abscesses, but in which no X-Rays were taken.

The statement of a positive history means that one or both parents have died of apoplexy, uremia or heart failure. Moderate sclerosis refers to the radials, which, when empty, are palpable. Moderately severe sclerosis refers to radials which are becoming tortuous. Severe sclerosis to those becoming tortuous and beaded; while very severe designates a pipe-stem condition of the blood vessels.

By the term "nervous," we refer, first, to a group of patients with nervous temperaments who are high strung, intense, always keyed up to a high pitch, always on the go, never relaxing, whose motors always run at high speed. This group doesn't know how to play, but are Rooseveltian in that they are intense in all they do and a vacation means a change of but more strenuous work. These patients are always prompt at their appointsments, are exacting, and in business very successful. The second group compose women who are in the menopause period.

The following cases reported were a group of

patients seen by Dr. Dudley Fulton and myself during the past four years, whose systolic blood pressures were 160 or above, and upon whom we had sufficient data to warrant a study.

Of the 150 patients, 129, or 85 per cent. were between the ages of 40 and 70 years. Eighty-four, or 56 per cent., were females, while 66, or 44 per cent., were males.

One hundred and thirteen of the 150 belong to the nervous group. Forty-five of these being patients (women) in the menopause period. Ninety-six of the 150 used no tobacco, while but two of the remaining gave a history of using it to excess. One hundred of this group were total abstainers, and but three gave a history of liquor abuse. Sixteen patients were afflicted with over-eating, and 17 with obesity. Thirty-one, or 20 per cent., had apical abscesses and 32 had bad teeth. Chronic constipation was present in 65, or 43 per cent.

The Wassermann test was done in 52 cases, being negative in all but one instance.

Thirty-five patients had the distinct signs of infected tonsils. How many more had this same condition, I do not know, but undoubtedly a goodly number.

A complete urine examination was done in 136 patients, a trace of albumin being found in practically all. Casts were present in but forty, however. Of 57 subjects upon whom the phthalein estimation was done 43 were normal and 14 below normal. The blood nitrogen was estimated in 44, being above normal in but six.

To classify the series into those who have a primary nephritis hypertension, and those who have a hypertensive cardio-vascular disease, according to Janeway's classification, we find thirty in the former group and 120 in the latter.

It has been almost one hundred years since Bright called attention to cardiac hypertrophy in nephritis. During this time there have been a thousand and one theories advanced to account for this condition and the accompanying increased blood pressure, but almost all have been disproven.

Von Bash, about one-half century ago, was the first to experimentally measure blood pressure, but it was twenty years before instruments were perfected so it could be estimated clinically.

There are two theories that persistently cling regarding the cause of hypertension, theories that are thoughtlessly held to-day.

First. That this condition is due to arterio-sclerosis.

Second. That increased blood pressure is synonymous with, and usually preceded by nephritis.

It has been definitely proven that primary arterio-sclerosis is not accompanied by hypertension, and that the sclerotic changes found in patients with high blood pressures are the results and not the cause. It has also been proven that the majority of hypertensions are not preceded by a nephritis.

Experimentally there are certain things that will increase blood pressure, such as barium chloride, lead poisoning, adrenalin, some portions of the incompletely oxidized proteid molecule and glomerular nephritis.

Lead poisoning will produce a perfectly typical picture of hypertension, followed by sclerosis of the blood vessels and the development of interstitial changes in the kidneys.

Many have clung to the theory of a toxemia of intestinal origin, but have never isolated the toxins. General credence is given, however, to the belief that blood pressure will be greatly raised by spasms of the splanchnic vessels as a result of constipation.

Those who think of arterio-sclerosis and hypertension synonymously, look to overeating, the abuse of liquor and tobacco, overwork, improper exercise, etc., as great causes. Others, as Martin Fisher, think infection lodging in the vasovasorum produces this condition.

The theory is also advanced that excessive innervation or stimulation from the nerve centers increase vascular tone, thus tending to push pressure up.

Bittorf has advanced the theory that hypertension is due to a disease of the depressor nerve or its endings in the aorta; thus messages that are sent to the brain which bring back a vasodilator response, are shut out.

One of the most fascinating and clinging theories has been that of increased activities of the supra-renals. The legs have been gradually knocked from under this by the inability to demonstrate any disease of the adrenals in hypertension, by the inability to find an increased amount of adrenalin in the blood in hypertension, and by the fact that the adrenals have been removed without a drop in pressure taking place for two or three days. Changes in other internal secretions have been advanced, but no definite proof has been forthcoming.

Increased blood viscosity was thought to be a cause for years but this bubble has burst since viscosity has been found normal in hypertensions.

General infections, as syphilis, typhoid, etc., appear to produce increased pressure at times, but these causes are certainly rare in comparison to the frequency of the condition. Many other less possible causes are mentioned. In fact, when I look into the literature on this subject I am reminded of a reviewer, who, after reading a dissertation upon a certain disease, exclaimed "we would ask what the conditions are which do *not* bring on this malady."

In the group of thirty patients whose increased pressure was due to kidney disease, I have included the prostatic obstruction cases also. This then, leaves 120, or 80 per cent. of the subjects whose hypertension was due to causes other than renal disease. This group belongs to those designated under the term "Hyperpyresis" by Albutt and the presclerotics of Huchard. I confess to find, upon looking the histories over, so few belonging to this group of primary renal hypertension.

I do not wish to be understood that none of the patients not belonging to this group had nephritis, for many of them did. In fact, all who

had had a high pressure for several years had all the signs of interstitial changes in the kidneys.

The group designated as being nervous, number 113, or 75 per cent. Subtracting the 45 who were in the period of the menopause, still leaves 45 per cent. of the entire number of patients. This, it seems to me is very striking, and if a larger series would still hold to the same proportion, would be a very suggestive hint as to the basic cause of the greater percentage of hypertensions. Some one will say that the nervous symptoms were the result of the increased blood pressure. To those I would emphasize the fact that the nervous symptoms greatly antedated the possibility of an increase in blood pressure.

How the nervous state caused a gradual pushing up of pressure is a question, the answer of which is not at present clear, but that it does do this I have no doubt. It is certain that there is either an increased vasomotor stimulus of central origin, or a hypertensive substance in the blood. If the adrenalin theory were true matters would be greatly simplified. No doubt being nervously strung up, strenuous and intensive in man is analogous to fear in the animal. According to naturalists, when an animal is scared there is an immediate pouring out of adrenalin, which causes the mobilizing of blood sugar and an increase of blood pressure. Thus the muscles are supplied freely with energy for fight or flight. The fear soon passes and the animal returns to normal.

In the nervous type of man this same condition in a modified form is constant, hence, with a continuous over secretion of adrenal substance bathing the vessels from month to month, would it not be natural for the pressure to gradually rise? To me this is an interesting theory, but by no means proven.

With the group whose pressures arose during the period of menopause, it is reasonable, especially since it is so large (30 per cent. of the entire series) to reason that the increased blood pressure is a result of the things that cause the menopause which is probably based upon a change or partial cessation of ovarian function.

Such a large percentage have apical abscesses and bad teeth, 40 per cent. combining both groups, that it makes food for thought. How great a factor this condition is can only be ascertained by greater study.

Infected tonsils belong in the same category as infected teeth. About 25 per cent. of the series had undoubted chronic tonsillar infection. This number is great enough to be seriously considered from an etiological standpoint.

It also seems plausible that, inasmuch as 43 per cent. of the whole number suffered from chronic constipation, this condition has a distinct bearing on hyptertension. Splanchnic spasms seems the mode by which this condition operates. However, the splendid work of Alvarez notwithstanding, it is difficult not to believe that occasionally one sees a patient who is absorbing a hypertensive substance from the bowel.

Our series would lead us to believe syphilis played a small part in producing hypertension. Wassermann reactions were done on all suspicious cases, yet but one out of 52 was positive.

In discussing the treatment I wish to make it clear that high blood pressure per se was not treated, but it was considered as a leading symptom, just as fever is in certain diseases.

In those cases whose etiology was a nephritis, and in the patients who had developed marked interstitial changes in the kidney, due either to increased pressure or the things that produce it, the importance of sustaining pressure was realized and measures were used accordingly.

It is useless and even dangerous, to try to reduce a pressure of 200 when the radials are beaded and tortuous, the urine contains albumin and casts, and when there is a greater night than day output, with a low fixed specific gravity. In a condition of this kind the treatment should be aimed at good elimination and a support of the heart muscle. Pressure is thus sustained.

It is in the nervous group, when gotten early, that real results may be secured. The treatment must be based upon the removal of the causes. Apical abscesses must be removed; free bowel drainage must be instituted and maintained; all points of infection, whether from appendix, tubes, gall bladder or tonsils, must be removed. A complete rest cure, and if necessary, a re-education of the patient's nervous system from a nervous to a more phlegmatic temperament, must be undertaken. With this group bromides are the supreme vaso-dilators, and one will find a lowering of blood pressure in just the proportion that nervous relaxation is obtained. Whether this medicine works by lessening nerve stimuli or sedating adrenal activity, or in neither of these ways, I do not know, but when combined with rest it works.

An observation of the use of thyroid extract has been very interesting. Repeatedly there have been pressures which, from the amount of cardiac hypertrophy and radial changes, one would think should be 150 systolic and 90 diastolic, but would persist around 170 and 100, which, upon the exhibition of five grains of fresh gland daily, would rather quickly subside to a safer level.

In connection with this we might recall that Sajous claims thyroid extract neutralizes adrenalin secretion.

The most happy results are obtained with women in the menopause period. Almost constant complaints with these patients are general nervousness and hot flashes. It is seldom that bromides, rest, and an empirical mixture of thyroid, ovarian and corpus luteum extracts will not only relieve the hot flashes and nervouness, but cause the blood pressure to drop to the region indicated by the amount of vascular sclerosis and cardiac hypertrophy. My observation has been that blood pressure drops as hot flashes disappear.

A case in point was a woman of fifty years who had had the best medical attention a good-sized California city afforded. She had been told she had a high blood pressure, and that all she could do was to lead a quiet life, avoiding all stress and excitement. Her pressure was 220

systolic and 120 diastolic; hot flashes were extremely annoying; she was generally nervous; a very poor sleeper; had been constipated for several years, and had three apical abscesses. Her last show had been several months back. The radials were palpable; her heart had increased 10 to 15 per cent. in size; but there were no signs of kidney interstitial changes. Three months of rest, with the judicious use of bromides, internal secretory products, removal of the diseased roots, with diet to regulate the bowel drainage, served to reduce pressure to the region of 155 systolic and 85 diastolic, at which point it has remained for nine months under a reasonably active life.

In conclusion I might add the following lessons and impressions received during this study.

Nephritis does not play so important a part in hypertensions as was formerly believed.

There is a large group having increased blood pressures who can be cured if gotten early, and greatly relieved if gotten later. All possible causes must be carefully searched out and radically treated, e. g., apical abscesses, chronic tonsillitis, chronic constipation, gall bladder or appendix inflammations, all pelvic and prostate infections, as well as the proper treatment of thyroid diseases. In addition, nervous habits must be changed, which in itself may mean the complete re-education of the patient. Too much emphasis cannot be placed upon insisting that a proper amount of rest and sleep be had.

The great frequency of increased pressure at the time of menopause. Every woman should have her blood pressure frequently taken during "the change," especially if hot flashes and nervousness are present. The marked relief of these symptoms by the use of bromides and internal secretory extracts, has been most gratifying. And finally I wish to emphasize the importance of sustaining blood pressure to the point indicated by the amount of kidney involvement.

1240 Merchants' National Bank Bldg.

PARALYSIS OF THE ESOPHAGUS.*

By H. Y. McNAUGHT, M. D., San Francisco.

Paralysis of the esophagus is a comparatively rare condition. In effect it is a stenosis, as the esophagus acts solely by segmentary stimulation. Gravity plays no part in the passage of a bolus to the stomach. This is shown in the ability of the individual to swallow quite as well when inverted. When however a motor paralysis exists no solids or liquids can pass to the stomach. Paralysis of other muscles of deglutition, such as the inferior constrictor, and the palatal muscles is frequently associated with esophageal paralysis.

Jackson classifies the paralysis of the esophagus as follows:

(1) Toxic type: such as diphtheritic paralysis.
(2) Purely functional: as in hysteria.
(3) Peripheral paralysis: as in neuritis.
(4) Central paralysis: usually from bulbar lesion as in glosso-labio-pharyngeal paralysis. The latter condition may be luetic. Jackson states that neuritis may also be luetic in origin but this is incorrect.

The differential diagnosis as between esophageal paralysis and other forms of stenosis is comparatively easy.

(1) General physical history of the patient: as presence of lues, etc.

(2) History of onset: No history of possible foreign body obstruction. Usually sudden onset: No pain on attempts to swallow or in intervals.

(3) Examination of the patient by both indirect and direct methods. By indirect examination with the laryngoscopic mirror the pyriform fossae are seen to be full of saliva (Jackson's sign for stenosis). In the absence of sensory paralysis this results in spasmodic coughing on attempted swallowing on account of overflow into the larynx.

By direct examination with the esophagoscope, there is an absence of resistance to a full sized instrument at the physiological constrictions, and chiefly at the crico-pharyngeus.

There may be a sensory as well as a motor paralysis present. If sensation is absent instrumentation may be done without exciting any reflex cough or gagging. Hysterical paralysis can be excluded if we have an absence of the normal contraction at the crico-pharyngeus. A cause of esophageal paralysis not mentioned specifically in Jackson's classification is due to occlusion of the posterior inferior cerebellar artery. While a comparatively rare condition, some thirty cases have been reported by various writers, the syndrome is so definite and one might say almost dramatic, that we should readily recognize it once we know the picture. It may be permitted at this time to review the anatomy of the parts involved.

The posterior inferior cerebellar artery is usually described as the largest branch of the vertebral artery, and in its course as passing obliqely backward around the medulla oblongata, at first between the roots of the hypoglossal nerve then between the roots of the accessory and vagus nerves, to end on the inferior surface of the cerebellum.

It has been shown recently that there is considerable variability in the course of the artery; that in many cases, instead of passing directly backward after its origin from the vertebral, it forms a distinct loop the convexity of which is towards the pons. An absence of the artery on the right side has frequently been noted.

The ascending limb of the loop usually passes upward in the posteriolateral sulcus, and in this position supplies small terminal branches to the medulla oblongata. Occlusion of the post. inf. cerebellar artery produces a definite clinical syndrome, in spite of the variability in the course of the artery, and in the number of branches it supplies to the medulla oblongata. Various investigators have shown that the lesion in the medulla extends laterally from the restiform body to the inferior olive and vertically from where the restiform body passes into the cerebellum to about the middle of the hypoglossal nucleus. The structures usually involved are the descending root of the fifth nerve, the nucleus ambiguus, the glosso-pharyn-

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